



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BLVD
ARLINGTON, TEXAS 76011-4511

April 23, 2012

Mr. Adam C. Heflin, Senior Vice
President and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT – NRC INTEGRATED INSPECTION REPORT
NUMBER 05000483/2012002

Dear Mr. Heflin,

On March 27, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Callaway Plant. The enclosed inspection report documents the inspection results which were discussed on April 2, 2012, with Mr. F. Diya, Vice President Nuclear Operations, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

One self-revealing finding of very low safety significance (Green) was identified during this inspection. This finding was determined to involve a violation of NRC requirements. Further, licensee-identified violations which were determined to be of very low safety significance are listed in this report. The NRC is treating these violations as non-cited violations consistent with Section 2.3.2 of the Enforcement Policy.

If you contest these non-cited violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Callaway Plant.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's

A. Heflin

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Sincerely,

/RA/

Neil O'Keefe, Chief
Project Branch B
Division of Reactor Projects

Docket No.: 05000483
License No: NPF-30

Enclosure: Inspection Report 05000483/2012002
w/ Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket: 05000483

License: NPF-30

Report: 05000483/2012002

Licensee: Union Electric Company

Facility: Callaway Plant

Location: Junction Highway CC and Highway O

Dates: January 1 through March 27, 2012

Inspectors: D. Dumbacher, Senior Resident Inspector
Z. Hollcraft, Resident Inspector

Approved By: N. O'Keefe, Chief, Project Branch B
Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000483/2012002; 01/01-03/27/2012; Callaway Plant, Integrated Resident and Regional Report; Event Follow-up.

The report covered a 3-month period of inspection by resident inspectors. One Green non-cited violation of significance was identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." The cross-cutting aspect is determined using Inspection Manual Chapter 0310, "Components Within the Cross-Cutting Areas." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified Findings and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The inspectors reviewed a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," after the licensee failed to ensure that testing used to verify the adequacy of a steam generator drain plug was conducted under expected design conditions. On November 1, 2011, containment workers noticed reactor coolant system leakage out of the steam generator B manway onto the floor. Reactor coolant system water from the reactor cavity was draining past a dislodged tube plug out the steam generator manway onto the floor below. Plant operators verified the spent fuel pool isolation to the reactor cavity was intact and pumped the approximately 400,000 gallons of reactor cavity water to the refueling water storage tank. This stopped the leak and left the reactor coolant system at a midloop condition. The licensee's root cause analysis determined that criteria for the drain plug design and installation specifications were inadequate. Specifically, the plug had not been tested under expected conditions such as a slick environment due to boron in the water. Testing with a simulated boric acid solution revealed that slippage occurred at much lower loads than the 70 psi assumed in the original design review. The possibility of side loads being applied to the plug during eddy current maintenance had also not been properly considered. Callaway Action Request 201109257 was generated with actions to address the causes of the plug becoming dislodged.

This finding is more than minor because it is associated with the reactor coolant system equipment and barrier performance attribute of the Barrier Integrity Cornerstone and affects the associated cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. A senior reactor analyst performed a bounding significance determination using NRC Inspection Manual 0609, Appendix G, "Shutdown Operations Significance Determination Process." The senior reactor

analyst determined that there was very little potential for core damage because Callaway Plant was defueled with the reactor head removed at the time. This finding has no cross-cutting aspect because the design plug was tested in 2007, and therefore, is not indicative of current plant performance. (Section 4OA3)

B. Licensee-Identified Violations

Two violations of very low safety significance, which were identified by the licensee, have been reviewed by the inspectors. Corrective actions taken or planned have been entered into the licensee's corrective action program. These violations and Callaway action request numbers are listed in Section 4OA7.

REPORT DETAILS

Summary of Plant Status

Callaway operated at 100 percent power for the duration of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

Since solar flares and thunderstorms with potential tornados and high winds were forecast in the vicinity of the Callaway Plant, the inspectors reviewed the plant personnel's overall preparations/protection for the expected weather conditions. On March 8, 2012, the inspectors walked down the plant's main and unit auxiliary transformers because their functions could be affected by predicted significant solar flares. Also, on March 20, 2012, with severe thunderstorms predicted, the inspectors walked down the plant's turbine-driven auxiliary feedwater pump exhaust piping and the switchyard as their safety-related functions could be affected by potential high winds or tornado-generated missiles. Switchyard work was in progress due to planned maintenance on breaker MDV51. The inspectors evaluated the plant staff's preparations against the site's procedures and determined that the staff's actions were adequate. During the inspection, the inspectors focused on plant-specific design features and the licensee's procedures used to respond to specified adverse weather conditions. The inspectors also toured the plant grounds to look for any loose debris that could become missiles during a tornado. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant. Additionally, the inspectors reviewed the Final Safety Analysis Report and performance requirements for the systems selected for inspection, and verified that operator actions were appropriate as specified by plant-specific procedures. The inspectors also reviewed a sample of corrective action program items to verify that the licensee identified adverse weather issues at an appropriate threshold and dispositioned them through the corrective action program in accordance with station corrective action procedures. Specific documents reviewed during this inspection are listed in the attachment.

- March 8, 2012, walkdown of plant main and unit auxiliary transformers and review of actions for predicted significant solar flares
- March 20, 2012, walkdown and review of the turbine-driven auxiliary feedwater and switchyard systems just prior to predicted severe thunderstorms

These activities constitute completion of two readiness for impending adverse weather condition samples as defined in Inspection Procedure 71111.01-05.

b. Findings

No findings were identified.

1R04 Equipment Alignments (71111.04)

Partial Walkdown

a. Inspection Scope

The inspectors performed partial system walkdowns of the following risk-significant systems:

- March 7, 2012, atmospheric steam dump system
- March 13, 2012, reactor coolant sampling system containment isolation valves

The inspectors selected these systems based on their risk significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could affect the function of the system, and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, Final Safety Analysis Report, technical specification requirements, administrative technical specifications, outstanding work orders, condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have rendered the systems incapable of performing their intended functions. The inspectors inspected accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program with the appropriate significance characterization. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of two partial system walkdown samples as defined in Inspection Procedure 71111.04-05.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Fire Inspection Tours

a. Inspection Scope

The inspectors conducted fire protection walkdowns that were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

- January 5, 2012, control room air conditioning and filtration units rooms 1501 and 1512
- February 16, 2012, refueling water storage tank valve house
- March 25, 2012, spent fuel pool train A heat exchanger and pump room 6105
- March 27, 2012, control building train A electrical cable chase room 3618

The inspectors reviewed areas to assess if licensee personnel had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant; effectively maintained fire detection and suppression capability; maintained passive fire protection features in good material condition; and had implemented adequate compensatory measures for out of service, degraded or inoperable fire protection equipment, systems, or features, in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to affect equipment that could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the attachment, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's corrective action program.

These activities constitute completion of four quarterly fire-protection inspection samples as defined in Inspection Procedure 71111.05-05.

b. Findings

No findings were identified.

.2 Annual Fire Protection Drill Observation (71111.05A)

a. Inspection Scope

On January 30, 2012, the inspectors observed a fire brigade activation in response to a simulated fire in the turbine building 2000 foot elevation turbine lube oil storage room. The observation evaluated the readiness of the plant fire brigade to fight fires. The inspectors verified that the licensee staff identified deficiencies; openly discussed them in a self-critical manner at the drill debrief, and took appropriate corrective actions. Specific attributes evaluated were (1) proper wearing of turnout gear and self-contained breathing apparatus; (2) proper use and layout of fire hoses; (3) employment of appropriate fire fighting techniques; (4) sufficient firefighting equipment brought to the scene; (5) effectiveness of fire brigade leader communications, command, and control; (6) search for victims and propagation of the fire into other plant areas; (7) smoke removal operations; (8) utilization of preplanned strategies; (9) adherence to the preplanned drill scenario; and (10) drill objectives.

These activities constitute completion of one annual fire-protection inspection sample as defined in Inspection Procedure 71111.05-05.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11)

.1 Quarterly Review of Licensed Operator Requalification Program

a. Inspection Scope

On February 2, 2012, the inspectors observed a crew of licensed operators in the plant's simulator during licensed operator continuing training session 12-01.

The inspectors assessed the following areas:

- Licensed operator performance
- The ability of the licensee to administer the evaluations
- The modeling and performance of the control room simulator
- The quality of post scenario critiques
- Follow-up actions taken by the licensee for identified discrepancies

Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one quarterly licensed operator requalification program sample as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

.2 Quarterly Observation of Licensed Operator Performance

a. Inspection Scope

On the dates listed below the inspectors observed the performance of on-shift licensed operators in the plant's main control room. The inspectors observed the operators' performance of the following activities:

- January 25, 2012, control room routine activities
- February 8, 2012, testing of residual heat removal train B
- March 14, 2012, response to oscillations of the reactor water level indicator BB-LT-1322

The inspectors evaluated the following areas:

- Licensed operator performance
- Crew's clarity and formality of communications
- Crew's prioritization, interpretation, and verification of annunciator alarms
- Control board manipulations
- Oversight and direction from supervisors

In addition, the inspectors assessed the operators' adherence to plant procedures, including the conduct of operations procedure and other operations department policies. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one quarterly licensed-operator performance sample as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors evaluated degraded performance issues involving the following risk significant systems:

- Component cooling water valve EGHV0054
- Nonsafety auxiliary feedwater pump

The inspectors reviewed events such as where ineffective equipment maintenance has resulted in valid or invalid automatic actuations of engineered safeguards systems and independently verified the licensee's actions to address system performance or condition problems in terms of the following:

- Implementing appropriate work practices
- Identifying and addressing common cause failures
- Scoping of systems in accordance with 10 CFR 50.65(b)
- Characterizing system reliability issues for performance monitoring
- Charging unavailability for performance monitoring
- Trending key parameters for condition monitoring
- Ensuring proper classification in accordance with 10 CFR 50.65(a)(1) or -(a)(2)
- Verifying appropriate performance criteria for structures, systems, and components classified as having an adequate demonstration of performance through preventive maintenance, as described in 10 CFR 50.65(a)(2), or as requiring the establishment of appropriate and adequate goals and corrective actions for systems classified as not having adequate performance, as described in 10 CFR 50.65(a)(1)

The inspectors assessed performance issues with respect to the reliability, availability, and condition monitoring of the system. In addition, the inspectors verified maintenance effectiveness issues were entered into the corrective action program with the appropriate significance characterization. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of two quarterly maintenance effectiveness samples as defined in Inspection Procedure 71111.12-05.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed licensee personnel's evaluation and management of plant risk for the maintenance and emergent work activities affecting risk-significant and safety-related equipment listed below to verify that the appropriate risk assessments were performed prior to removing equipment for work:

- January 17, 2012, alternate emergency power supply diesel generator maintenance and maintenance on service water to essential service water cross-tie valves, Job 05512756
- February 8, 2012, elevated plant risk due to maintenance on residual heat removal train B system while the threshold to yellow risk was lowered due to an extended outage on the plant startup feedwater pump, Job 10517412
- March 7, 2012, elevated plant risk due to planned maintenance on component cooling water and centrifugal charging pump train B systems with one alternate emergency power supply diesel not functional, Jobs 11510282 and 06522912
- March 22, 2012, yellow plant risk due to unplanned void formations in component cooling water system train A, Callaway Action Request 201202157
- March 26, 2012, yellow plant risk due to replacement of a failed load shed and emergency load sequencer train A power supply, Job 12001552

The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that licensee personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When licensee personnel performed emergent work, the inspectors verified that the licensee personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work, discussed the results of the assessment with the licensee's probabilistic risk analyst or shift technical advisor, and verified plant conditions were consistent with the risk assessment. The inspectors also reviewed the technical specification requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of five maintenance risk assessments and emergent work control inspection samples as defined in Inspection Procedure 71111.13-05.

b. Findings

No findings were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the following assessments:

- January 4, 2012, Callaway Action Request 201200125, essential service water isolation valve (EFHV0038) leak-by

- January 23, 2012, Callaway Action Request 201200502, void in safety injection accumulator fill line and safety injection header overpressure
- February 21, 2012, Callaway Action Request 201201357, non-seismically mounted heater in refueling water storage tank valve house

The inspectors selected these operability and functionality assessments based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the evaluations to ensure technical specification operability was properly justified and to verify the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the technical specifications and Final Safety Analysis Report to the licensee's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sampling of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of three operability evaluations inspection samples as defined in Inspection Procedure 71111.15-05.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18)

Permanent Modifications

a. Inspection Scope

The inspectors reviewed key affected parameters associated with energy needs, materials, replacement components, equipment protection from hazards, operations, flow paths, pressure boundary, structural design, process medium properties, licensing basis, and failure modes for the permanent modification listed below:

- Sightglass replacement for residual heat removal train B pump motor, MP 12-0005

The inspectors verified that modification preparation, staging, and implementation did not impair emergency/abnormal operating procedure actions, key safety functions, or operator response to loss of key safety functions; postmodification testing will maintain the plant in a safe configuration during testing by verifying that unintended system interactions will not occur; systems, structures and components' performance characteristics still meet the design basis; the modification design assumptions were appropriate; the modification test acceptance criteria will be met; and licensee personnel

identified and implemented appropriate corrective actions associated with permanent plant modifications. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one sample for permanent plant modifications as defined in Inspection Procedure 71111.18-05.

b. Findings

No findings were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the following postmaintenance activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- January 25, 2012, postmaintenance test on repaired breaker for containment spray valve BNHV0004, Jobs 11512473 and 12000498
- February 8, 2012, postmaintenance test on residual heat removal train B pump and support components, Jobs 09505165 and 11513860
- February 18, 2012, postmaintenance test on essential service water train B strainer, Job 12001037
- March 7, 2012, postmaintenance test on centrifugal charging train B pump, Job 11510282
- March 22, 2012, postmaintenance test on the train A normal service water pump, Job 11500554

The inspectors selected these activities based upon the structure, system, or component's ability to affect risk. The inspectors evaluated these activities for the following:

- The effect of testing on the plant had been adequately addressed; testing was adequate for the maintenance performed
- Acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate

The inspectors evaluated the activities against the technical specifications, the Final Safety Analysis Report, 10 CFR Part 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors

reviewed corrective action documents associated with postmaintenance tests to determine whether the licensee was identifying problems and entering them in the corrective action program and that the problems were being corrected commensurate with their importance to safety. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of five postmaintenance testing inspection samples as defined in Inspection Procedure 71111.19-05.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors reviewed the Final Safety Analysis Report, procedure requirements, and technical specifications to ensure that the surveillance activities listed below demonstrated that the systems, structures, and/or components tested were capable of performing their intended safety functions. The inspectors either witnessed or reviewed test data to verify that the significant surveillance test attributes were adequate to address the following:

- Preconditioning
- Evaluation of testing impact on the plant
- Acceptance criteria
- Test equipment
- Procedures
- Jumper/lifted lead controls
- Test data
- Testing frequency and method demonstrated technical specification operability
- Test equipment removal
- Restoration of plant systems
- Fulfillment of ASME Code requirements
- Updating of performance indicator data

- Engineering evaluations, root causes, and bases for returning tested systems, structures, and components not meeting the test acceptance criteria were correct
- Reference setting data
- Annunciators and alarms setpoints

The inspectors also verified that licensee personnel identified and implemented any needed corrective actions associated with the surveillance testing.

- January 18, 2012, emergency diesel generator train A fast start, Job 11508474
- February 14, 2012, ultimate heat sink train B fan runs, Job 12500702
- February 21, 2012, inservice test of the centrifugal charging train A pump, Job 11514192
- February 27, 2012, inservice test of the motor-driven auxiliary feedwater train A pump, Job 1151450
- March 2, 2012, inservice test of the residual heat removal train A pump, Job 12000951

Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of two routine and three inservice test samples for a total of five surveillance testing inspection samples as defined in Inspection Procedure 71111.22-05.

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06)

Emergency Preparedness Drill Observation

a. Inspection Scope

The inspectors evaluated the conduct of a routine licensee emergency drill on January 24, 2012, to identify any weaknesses and deficiencies in classification, notification, and protective action recommendation development activities. The inspectors observed emergency response operations in the Technical Support Center and Emergency Operations Facility to determine whether the event classification, notifications, and protective action recommendations were performed in accordance with

procedures. The inspectors also attended the licensee drill critique to compare any inspector-observed weakness with those identified by the licensee staff in order to evaluate the critique and to verify whether the licensee staff was properly identifying weaknesses and entering them into the corrective action program. As part of the inspection, the inspectors reviewed the drill package and other documents listed in the attachment.

These activities constitute completion of one sample as defined in Inspection Procedure 71114.06-05.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Security

4OA1 Performance Indicator Verification (71151)

.1 Data Submission Issue

a. Inspection Scope

The inspectors performed a review of the performance indicator data submitted by the licensee for the fourth Quarter 2011 performance indicators for any obvious inconsistencies prior to its public release in accordance with Inspection Manual Chapter 0608, "Performance Indicator Program."

This review was performed as part of the inspectors' normal plant status activities and, as such, did not constitute a separate inspection sample.

b. Findings

No findings were identified.

.2 Mitigating Systems Performance Index - Emergency ac Power System (MS06)

a. Inspection Scope

The inspectors sampled licensee submittals for the mitigating systems performance index - emergency ac power system performance indicator for the period from the first quarter 2011 through the fourth quarter 2011. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's operator

narrative logs, mitigating systems performance index derivation reports, issue reports, event reports, and NRC integrated inspection reports for the period of January 1, 2011, through December 31, 2011, to validate the accuracy of the submittals. The inspectors reviewed the mitigating systems performance index component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, that the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and none were identified. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of one mitigating systems performance index - emergency ac power system sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.3 Mitigating Systems Performance Index - Cooling Water Systems (MS10)

a. Inspection Scope

The inspectors sampled licensee submittals for the mitigating systems performance index - cooling water systems performance indicator for the period from the first quarter 2011 through the fourth quarter 2011. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's operator narrative logs, issue reports, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports for the period of January 1, 2011, through December 31, 2011, to validate the accuracy of the submittals. The inspectors reviewed the mitigating systems performance index component risk coefficient to determine if it had changed by more than 25 percent in value since the previous inspection, and if so, that the change was in accordance with applicable NEI guidance. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and none were identified. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of one mitigating systems performance index - cooling water system sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.4 Reactor Coolant System Specific Activity (BI01)

a. Inspection Scope

The inspectors sampled licensee submittals for the reactor coolant system specific activity performance indicator for the period from the first quarter 2011 through the fourth quarter 2011. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's reactor coolant system chemistry samples, technical specification requirements, issue reports, event reports, and NRC integrated inspection reports for the period of January 1, 2011, through December 31, 2011, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and none were identified. In addition to record reviews, the inspectors observed a chemistry technician obtain and analyze a reactor coolant system sample. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of one reactor coolant system specific activity sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Routine Review of Identification and Resolution of Problems

a. Inspection Scope

As part of the various baseline inspection procedures discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee's corrective action program at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. The inspectors reviewed attributes that included the complete and accurate identification of the problem; the timely correction, commensurate with the safety significance; the evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent of condition reviews, and previous occurrence reviews; and the classification, prioritization, focus, and timeliness of corrective actions. Minor issues entered into the licensee's corrective action program because of the inspectors' observations are included in the attached list of documents reviewed.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure, they were considered an

integral part of the inspections performed during the quarter and documented in Section 1 of this report.

b. Findings

No findings were identified.

.2 Daily Corrective Action Program Reviews

a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's corrective action program. The inspectors accomplished this through review of the station's daily corrective action documents.

The inspectors performed these daily reviews as part of their daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

b. Findings

No findings were identified.

.3 Selected Issue Follow-up Inspection

a. Inspection Scope

During a review of items entered in the licensee's corrective action program, the inspectors reviewed a corrective action item documenting:

- Alignment of the refueling water storage tank to the nonseismically qualified spent fuel pool purification system
- Loss of the Technical Support Center emergency diesel generator

These activities constitute completion of two in-depth problem identification and resolution samples as defined in Inspection Procedure 71152-05.

b. Findings

No findings were identified.

.4OA3 Event Follow-up (71153)

a. Event Response

On November 1, 2011, a dislodged steam generator drain plug caused a reactor coolant system leak into containment. The NRC resident inspectors responded to the plant to review plant status, communicate the event to supervision, evaluate performance of

mitigating systems and ensure proper licensee actions, event classification, and notifications.

On February 22, 2012, while in Mode 1, "Power Operation," during maintenance on safety injection train A pumps, operators opened valve EMHV8807A for maintenance. This unintentionally created a flowpath from the chemical and volume control system to the refueling water storage tank and briefly resulted in a loss of volume control tank inventory. The NRC resident inspectors responded to the plant to review plant status, communicate the event to supervision, evaluate performance of mitigating systems and ensure proper licensee actions, event classification, and notifications.

b. Findings

1. Introduction. The inspectors reviewed a Green self-revealing non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," involving the licensee's failure to ensure that testing used to verify the adequacy of a steam generator drain plug was conducted under expected design conditions. This contributed to loss of the drain plug and an unisolable 30 gpm reactor coolant system leak during steam generator tube inspections.

Description. On November 1, 2011, Callaway Plant was defueled with the reactor head removed and the reactor coolant system flooded up to the level of the spent fuel pool. Reactor core offload had been completed on October 24, 2011. The steam generator bowl primary manway was opened for eddy current testing.

At 8:04 a.m. workers noticed reactor coolant system leakage out of the steam generator B manway onto the floor. Reactor coolant system water from the reactor cavity was draining past a dislodged tube plug, into the bowl, and out through the manway onto the floor below. Operators took action at 9:10 a.m. to pump down the approximately 400,000 gallons of reactor coolant system water in the cavity to the refueling water storage tank. This left the reactor coolant system at approximately mid-loop level, the same level as the drain tube, thus stopping the leakage. In addition to no fuel in the reactor vessel there were no high dose components within the upper reactor cavity area.

Each of the Callaway steam generators has a bowl on the reactor coolant side with 3/4-inch hot and cold leg self-draining tubes. These tubes have plugs installed and secured when steam generator nozzle dams are installed. These drain plugs are designed as resistance fit devices. An internal threaded rod is used to extend internal tabs to press the urethane outer plug material against the inside of the drain tube wall. A wrench is used to tighten the plug "hand tight." The function entirely depends on the resistance between the plug and the tube wall to keep the plug in place against system pressure and prevent leakage. These plugs were designed to isolate the reactor coolant system from the bowl which is open to the atmosphere during eddy current testing. In 2007, these plugs were initially tested using a "hand tight" criteria up to 70 psi with no leakage or pressure drop noted.

Small robotic devices were placed within the steam generator bowls to locate and drive the eddy current probes through the steam generator tubes. The robotic device's suction foot is often in close proximity to the drain plug. Shortly after 5 a.m. on November 1, 2011, the robotic device was moved inside the steam generator B bowl. The licensee stated that the robotic device had been known to collide with the drain plug but it could not be determined whether the 5 a.m. move had contacted the plug.

After the event, licensee management decided to complete the eddy current inservice inspection activity prior to the core reload and other reactor vessel inspection activities. The licensee's root cause analysis determined that criteria for the drain plug design and installation specifications were inadequate. Specifically, the analysis determined that the plug had not been tested under expected conditions such as with drain tube irregularities or a slick environment due to boron. Testing with a simulated boric acid solution revealed that slippage occurred at much lower loads than the 70 psi in the original test. Also, the specification of "hand tight" was not well understood as a standard for the tightness of the plug. Additionally, the possibility of side loads being applied to the plug (such as by bumping from the robotic device) had not been considered. As a result, there was inadequate procedural guidance for installation of the plug and operation of the robotic device.

Analysis. The performance deficiency associated with this finding was inadequate design control measures for the steam generator drain plugs. Specifically, the licensee failed to perform suitable qualifications testing of a prototype unit under expected design conditions. This finding is more than minor because it is associated with the reactor coolant system equipment and barrier performance attribute of the Barrier Integrity Cornerstone and affects the associated cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. The inspectors referred the issue to a Region IV senior reactor analyst for the significance determination. The analyst used NRC Inspection Manual 0609, Appendix G, "Shutdown Operations Significance Determination Process," to evaluate the significance of the finding. Appendix G applies when the residual heat removal entry conditions begin and ends when the licensee exits the residual heat removal operational conditions and heats up the reactor. Appendix G defines a shutdown operation as an operational mode where more than one fuel assembly is in the reactor vessel and the decay heat removal system is in operation. However, all of the fuel had been removed from the vessel at the time of the leak. Therefore, there was very little potential for core damage (the delta-CDF was near zero). The senior reactor analyst determined the finding to be Green. This finding has no cross-cutting aspect because the design plug was tested in 2007, and therefore, is not indicative of current plant performance.

Enforcement. Title 10 of the Code of Federal Regulations, Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking processes, it shall include suitable qualifications testing of a prototype unit under the most adverse design conditions. Contrary to this, the licensee relied on a 2007 test program to verify the adequacy of a specific design feature in lieu of other verifying or

checking processes, but failed to ensure suitable qualification testing of the prototype unit of drain tube plug to demonstrate it would function under expected adverse conditions. Specifically, the testing did not evaluate the effect of borated water inside the drain tubes. This resulted in a loss of reactor coolant system integrity. Because this finding is of very low safety significance and was entered into the licensee's corrective action program as Callaway Action Request 201109257, this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000483/2012002-01, "Failure to Properly Evaluate the Design of Steam Generator Drain Plugs."

2. (Closed) Licensee Event Report 2011-005-00: Manual Isolation Valve Unable to Meet Closure Requirements

On October 24 and 27, 2011, licensee operators noted that valve ABV0040 (the manual block valve for steam generator train B atmospheric steam dump) required an excessive amount of time (more than 20 minutes) to close. Subsequent evaluation determined that this caused the associated line to be inoperable per Technical Specification 3.7.4. Specifically, the valve could not be closed in time to meet licensing basis assumptions for isolation of an atmospheric steam dump from a steam generator with a tube rupture. The other three manual valves were confirmed operable. The cause was attributed to poor preventative maintenance and testing practices. License Event Report 2011-005-00 was submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by technical specifications. The resident inspectors and a Region IV senior risk analyst reviewed the licensee's submittal and determined that the report adequately documented the event including the potential safety consequences and necessary corrective actions. Enforcement aspects associated with this license event report are discussed in Section 4OA7. No additional violations were identified during the inspectors' review. This license event report is closed.

3. (Closed) Licensee Event Report 2011-006-00: Postulated Fire Could Damage High Density Polyethylene Essential Service Water Piping

On November 9, 2011, the licensee's staff initiated Callaway Action Request 201109569 to document that the licensee had performed an inadequate failure modes and effects analysis for plant modification 07-0066, which had installed high density polyethylene piping into control building room 3101. The failure modes and effects analysis did not identify that the effects of a postulated design basis fire in room 3101 could result in failure of the essential service water system. The plant's original design relied on an adequate degree of physical separation between the two essential service water trains. The modification resulted in a postulated design basis fire being capable of damaging one train of essential service water high density polyethylene piping such that subsequent flooding could result in a loss of function of both trains. Callaway Plant Final Safety Analysis Report, section 9.5B, describes the assumption of component failures caused as a "direct consequence of a fire." The licensee extended the direct consequences to include an assumed consequential flood event. Thus, the consequential flood event is an example of an unanalyzed condition that could significantly degrade plant safety and was reported pursuant to 10 CFR 50.73(a)(2)(ii)(B).

The inspectors had previously identified a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to provide adequate design control measures for verifying the adequacy of the flooding analysis associated with the 2009 high density polyethylene piping modification. The enforcement aspects of this violation are discussed in Non-cited Violation 05000483/2011003-01. This license event report documents another credible event that could lead to the initiation of such a flooding event. As immediate corrective action the licensee initiated an hourly firewatch to ensure low combustibles and early fire detection per the Callaway Plant fire protection program. Long term corrective action was to be addressed as part of the licensee's transition to 10 CFR 50.48(c), "National Fire Protection Association Standard NFPA 805." Additionally, corrective actions have been initiated to address the licensee's modification process deficiencies. No additional violations were identified during the inspectors' review. This licensee event report is closed.

4. (Closed) Licensee Event Report 2011-007-00: Non-compliance with Technical Specification 3.9.2, Unborated Water Source Isolation Valves

On November 7, 2011, operators entered Mode 6, "Refueling," with an unborated water source isolation valve closed but not secured. Technical Specification 3.9.2 requires that each valve used to isolate unborated water sources shall be secured in the closed position when in Mode 6. Valve BGV0601 had been opened on November 4, 2011, while the plant was in no defined mode to allow filling and venting the volume control tank. Later that night, as part of the tagging restoration of the volume control tank, valve BGV0601 was closed. The restoration did not require the valve to be secured. The lack of administrative controls to secure the valve was discovered on November 13, 2011. Immediate corrective action, to place a seal on the locking device for the valve, allowed exiting the technical specification limiting condition for operation. The cause was attributed to an inadequate procedure used for controlling unborated sources. License Event Report 2011-007-00 was submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by technical specifications. The resident inspectors reviewed the licensee's submittal and determined that the report adequately documented the event including the potential safety consequences and necessary corrective actions. Enforcement aspects associated with this license event report are discussed in Section 4OA7 of this report. No additional violations were identified during the inspectors' review. This license event report is closed.

4OA6 Meetings

Exit Meeting Summary

On April 2, 2012, the inspectors presented the inspection results to Mr. F. Diya, Vice President Nuclear Operations, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of Section 2.3.2 of the NRC Enforcement Policy for being dispositioned as non-cited violations.

- Technical Specification 3.7.4, "Atmospheric Steam Dump Valves (ASDs)," requires that four atmospheric steam dump lines shall be operable at all times in Modes 1, 2 and 3. Contrary to the above, on October 27, 2011, Callaway operators determined that valve ABV0040 (manual isolation valve for steam generator train B) had been inoperable for an indeterminate amount of time resulting in the atmospheric steam dump line, train B, being inoperable. Specifically, it took three operators more than 20 minutes to close the valve, which is more than the time required in licensing basis documents. The causes were determined to be poor preventative maintenance and inservice testing practices. The details of this issue are documented in License Event Report 05000483/2011-005-00. This finding is more than minor because it was associated with the equipment performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Using Manual Chapter 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," this finding required a Phase 3 significance determination to evaluate the risk of operators failing to isolate a steam generator during a tube rupture event. A Region IV senior reactor analyst verified that the finding was of very low safety significance. The delta-CDF was determined to be much less than 1E-6. The delta-LERF was determined to be much less than 1E-7. This finding was entered in the licensee's corrective action program as Callaway Action Request 201108992.
- Technical Specification 3.9.2, "Unborated Water Source Isolation Valves," requires that, in Mode 6, "Refueling," each valve used to isolate unborated water sources shall be secured in the closed position. Contrary to the above, on November 7, 2011, Callaway operators entered Mode 6 with an unborated water source isolation valve closed but not secured. Valve BGV0601 had been opened on November 4, 2011, while the plant was in no defined mode to allow filling and venting the volume control tank. Later that night, as part of the tagging restoration of the volume control tank, valve BGV0601 was closed but not secured. The lack of administrative controls to secure the valve was discovered on November 13, 2011. Immediate corrective action, to place a seal on the locking device for the valve, allowed exiting the technical specification limiting condition for operation. The cause was attributed to an inadequate procedure used for controlling unborated sources. The details of this issue are documented in License Event Report 05000483/2011-007-00. This finding is more than minor because it was associated with the procedure quality attribute of the Barrier Integrity Cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Using Manual Chapter 0609, Appendix G, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Operational Checklists for Both PWRs and BWRs," Checklist 4, "PWR Refueling Operation: RCS level > 23' or PWR Shutdown Operation with Time to Boil > 2 hours and Inventory in the

Pressurizer," this finding was determined to be of very low safety significance. This was because the finding did not:

- increase the likelihood of a loss of reactor coolant system inventory
- include findings that could result in a loss of reactor coolant system level instrumentation
- degrade the licensee's ability to terminate a leak path or add reactor coolant system inventory when needed
- degrade the licensee's ability to recover decay heat removal once it is lost

This finding was entered in the licensee's corrective action program as Callaway Action Request 201109689.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Becker, Supervising Engineer, S-NSSS
L. Graessle, Director, Operations Support
J. Little, Supervising Engineer, Regulatory Affairs
D. Neterer, Plant Director
S. Petzel, Consulting Engineer, Licensing
C. Reasoner, Vice President Engineering
A. Schnitz, Engineer, Licensing

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000483/2012-01	NCV	Failure to Properly Evaluate the Design of Steam Generator Drain Plugs (Section 4OA3)
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Closed

05000483/2011-005-00	LER	Manual Isolation Valve Unable to Meet Closure Requirements (Section 4OA3)
05000483/2011-006-00	LER	Postulated Fire Could Damage High Density Polyethylene Essential Service Water Piping (Section 4OA3)
05000483/2011-007-00	LER	Non-compliance with Technical Specification 3.9.2, Unborated Water Source Isolation Valves (Section 4OA3)

Discussed

05000483/2011-003-01	NCV	Failure to Maintain an Adequate Flooding Analysis for Room 3101 (Section 4OA3)
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LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

PROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
OTO-ZZ-0012	Severe Weather	23

CALLAWAY ACTION REQUESTS

201101253 201201806

JOBS

11004522

Section 1R04: Equipment Alignment

DRAWINGS

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
M-22AB01(Q)	Piping and Instrumentation Diagram Main Steam System	21
M-22SJ01(Q)	Piping and Instrumentation Diagram Nuclear Sampling System	4
M-22SJ04(Q)	Piping and Instrumentation Diagram Nuclear Sampling System	2

CALLAWAY ACTION REQUESTS

201108992 201110568

Section 1R05: Fire Protection

PROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
APA-ZZ-00703	Fire Protection Operability Criteria and Surveillance Requirements	20
APA-ZZ-00741	Control of Combustible Material	23

CALLAWAY ACTION REQUESTS

199701130 201200640

MISCELLANEOUS

<u>TITLE</u>	<u>DATE</u>
Fire Hazards Analysis for Final Safety Analysis Report Chapter 9.5.8	November 2011

Section 1R11: Licensed Operator Requalification Program**PROCEDURES**

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
ODP-ZZ-00001	Operations Department Code of Conduct	68
ODP-ZZ-00001, Addendum 1	Annunciator Response	7
ODP-ZZ-00001, Addendum 13	Shift Manager Communications	10
ODP-ZZ-00001, Addendum 14	Operations Management Expectations	7

Section 1R12: Maintenance Effectiveness**PROCEDURES**

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
EDP-ZZ-01128	Maintenance Rule Program	17
EDP-ZZ-01128, Appendix 4	AP-Condensate Storage and Transfer System	6

CALLAWAY ACTION REQUESTS

201103800	201011148	201102292	201102334	201102401
201103739	201103779	201105013	201109052	201109755

JOBS

09507321	10002240	10004486	10004489	10005439
11006316	11006805	10007513		

Section 1R13: Maintenance Risk Assessment and Emergent Work Controls**PROCEDURES**

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
EDP-ZZ-0129	Callaway Energy Center Risk Assessment	31
ODP-ZZ-00002	Equipment Status Control	51
OOA-ZZ-SM001	Safety Monitor	5

CALLAWAY ACTION REQUESTS

201201709	201202133	201202157
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JOBS

05512756 06522912 10517412 11510282 12001552

Section 1R15: Operability EvaluationsPROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
ODP-ZZ-00001, Addendum 15	Operability and Functionality Determinations	15

DRAWINGS

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
M-040241	HVAC Hanger Locations Tunnels, Trenches & Valve Houses Misc. Plans	1
M-241914	HVAC Non "Q" Standard Duct Hanger Details	4

CALLAWAY ACTION REQUESTS

201200125 201200502 201201357 201202157

MISCELLANEOUS

<u>NUMBER</u>	<u>TITLE</u>	<u>DATE</u>
2RC-1626-E	Request for Clarification of Information	April 12, 1983
WA-EQI-9408R.1	Electrical Equipment Installation Record	October 12, 1983

Section 1R18: Plant ModificationsCALLAWAY ACTION REQUESTS

201200995 201200998 201201006

JOBS

10517412

MISCELLANEOUS

<u>NUMBER</u>	<u>TITLE</u>
MP 12-005	Sight glass replacement/modification for DPEJ01B lower bearing

Section 1R19: Postmaintenance TestingPROCEDURE

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
OSP-EF-P001B	ESW Train B Inservice Test	62

CALLAWAY ACTION REQUESTS

201201309

JOBS

09505165	11510282	11513860	11500554	12001037
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Section 1R22: Surveillance TestingPROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
OSP-BG-P005A	Train A Centrifugal Charging Pump In-Service Test	41
OSP-EF-0003B	Train B UHS Cooling Tower Fans Test	9

JOBS

11508474	11514192	12500702
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Section 1EP6: Drill EvaluationTABLE TOP DRILL SCENARIO

<u>NUMBER</u>	<u>TITLE</u>	<u>DATE</u>
12-01	Annual ERO Training Table Top	January 10, 2012

Section 4OA1: Performance Indicator VerificationCALLAWAY ACTION REQUESTS

201106551

MISCELLANEOUS DOCUMENTS

<u>TITLE</u>	<u>REVISION</u>
Callaway Energy Center Mitigating System Performance Indicator (MSPI) Basis Document	9

Section 40A2: Identification and Resolution of Problems

PROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
OTN-EC-00001, Addendum 3	RWST Cleanup Operations	12

CALLAWAY ACTION REQUESTS

201201851

Section 40A3: Event Follow-Up

DRAWINGS

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
801748B	Callaway Drain Plug Assembly	1

CALLAWAY ACTION REQUESTS

201109257